

Space Weather Technical Forecast

Issued on Tuesday, 03 May 2022 at 13:01 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: No significant geomagnetic activity. Likely increasing chance of R1-R2 blackouts from region transiting southeastern limb.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has reached Moderate levels with an impulsive M1 flare at 03/0753UTC. This originated from ex-2992 (currently transiting the southeast limb), which produced an X2.2 on the previous rotation, and appears to still be significantly active, producing several other C-class flares in the last 12 hours or so. This region is likely to increase flare probabilities once it can be fully assessed as it rotates into view. Otherwise, the five numbered sunspot regions currently on the visible disc are all relatively simple and benign at present. A number of CMEs were observed being emitted from the farside of the Sun, but none of these have been assessed as Earth-directed.

Solar Wind / Geomagnetic Activity: The solar wind, observed at L1, has very slowly declined 440-490km/s to around 420km/s as the high speed stream from coronal hole 78 wanes. Density was below average. Total interplanetary magnetic field strength has been weak, with the north-south component, Bz, varying weakly between +3nT to -3nT. Phi angle has been mainly negative (towards the Sun). Geomagnetic activity was Quiet (Kp 0 to 2).

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) has been at background through the last 24 hours. High energy electron flux (greater than 2MeV) has varied between moderate and high levels, peaking at 1540 pfu 02/1540UTC. 24-hour integrated fluence initially followed a gently rising trend, but remains below the Active threshold. Observed fluence at 03/0000UTC was 6.68e7 integrated pfu.

Four-Day Space Weather Forecast Summary

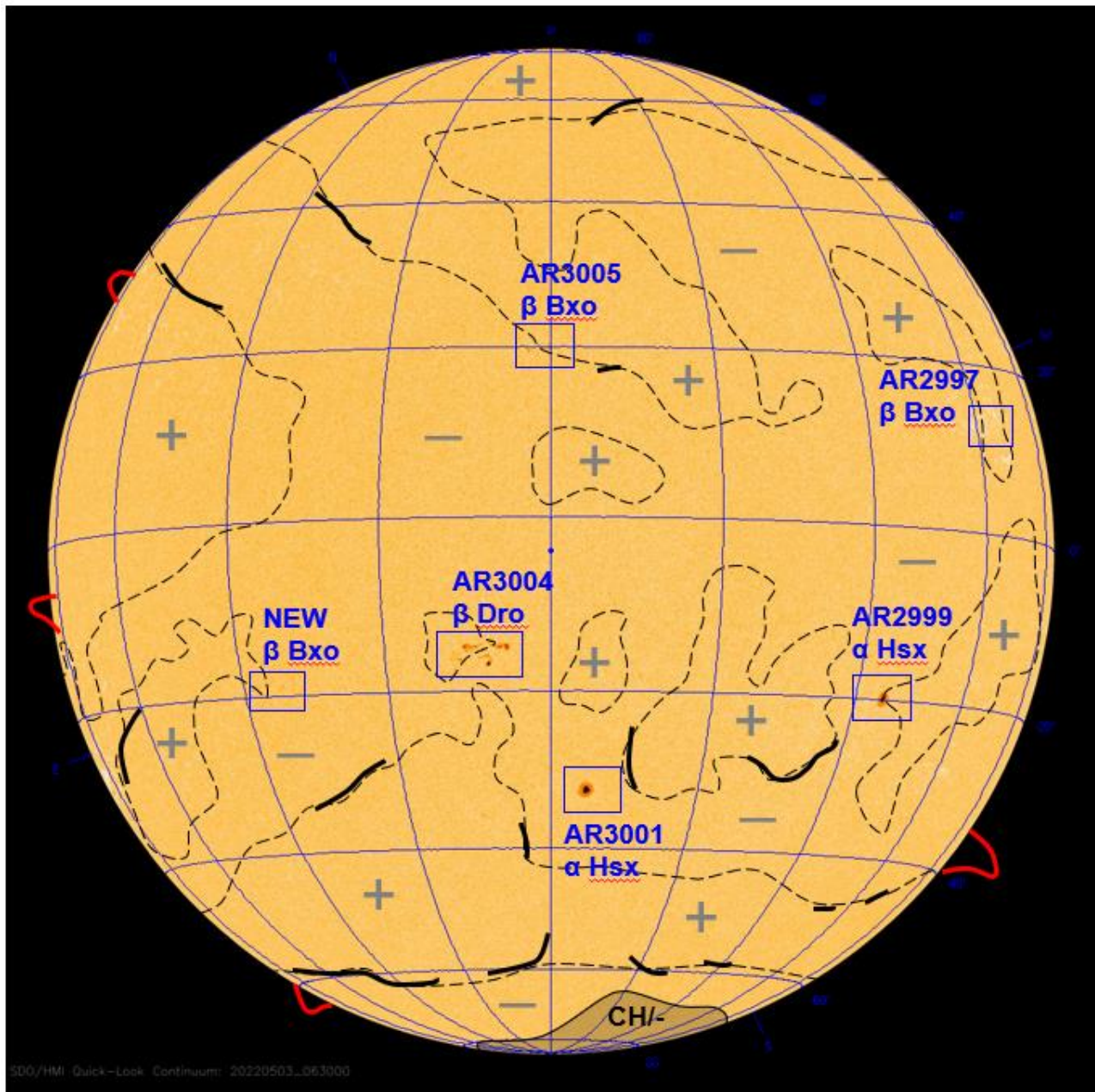
Solar Activity: Solar activity is expected to be mainly Low, but with an increasing chance of further Moderate class flare activity from a returning active region currently transiting the southeast limb.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs are currently forecast. The high speed stream from coronal hole 78 continues to gradually wane, with solar winds gradually settling near slow/ambient levels. There are no further high speed stream connections forecast in the next four days. Geomagnetic activity is expected to be initially Quiet, with isolated Unsettled intervals, becoming Quiet through the period.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is at background, with a very slight risk of radiation storms from any flare emanating from ex-2994 beyond the northwest limb. High energy electron flux (greater than 2MeV) is expected to continue to exceed the high (1e3 pfu) threshold during the period, with slightly declining peaks. Electron fluence is increasingly less likely to reach the Active (1e8 integrated pfu) through the next four days as a result of the expected declining flux.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

Figure 1. Solar Analysis Valid 03/0700UTC.



Key: Filament —, Prominence —, Magnetic Field Line - - -, Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α - β - γ - δ and Zurich-McIntosh Axx etc.

Geomagnetic Storms:

No Earth-directed CMEs are currently forecast.

The high speed stream from coronal hole 78 continues to gradually wane, with solar winds gradually settling near slow/ambient levels. There are no further high speed stream connections forecast in the next four days.

Geomagnetic activity is expected to be mainly Quiet throughout.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

None expected.

Radio Blackouts - X-Ray Flares:

Solar activity has reached Moderate levels with an impulsive M1 flare at 03/0753UTC. This originated from ex-2992 (currently transiting the southeast limb), which produced an X2.2 on the previous rotation, and appears to still be significantly active, producing several other C-class flares in the last 12 hours or so. This region is likely to increase flare probabilities once it can be fully assessed as it rotates into view.

Otherwise, the five numbered sunspot regions currently on the visible disc are all relatively simple and benign at present.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	10	10	10	10
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as measured by GOES-16 at GEO is at background levels, and is most likely to remain so through the next four days.

The activity and flaring from ex-2994 and neighbouring regions are still visible at Earth, with a risk of radiation storms from any energetic flaring. This risk decreases through 03 May (day 1) as the region becomes increasingly occulted behind the visible solar disc.

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	5	1	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm⁻²sr⁻¹s⁻¹)

High Energy Electrons Event ($\geq 2\text{MeV}$):

The high energy electron flux is expected to be close to the high ($1\text{e}3$ pfu) threshold through the next four days with no significant geomagnetic activity forecast. As there are no expected significant inputs into the radiation belts, the magnitude of the electron flux is likely to slowly decay, albeit still reaching high levels on diurnal peaks, especially early in the period.

Due to no significant inputs and a steadily declining electron flux, the electron fluence is increasingly unlikely to exceed the Active ($1\text{e}8$ integrated pfu) through the next four days. This is in line with the general trend indicated by the MOSWOC REFM model.

GEO Electron Environment	Level ($\text{cm}^{-2} \text{sr}^{-1} \text{day}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^8$	No	40	30	20	20
Very Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^9$	No	1	1	1	1

Figure 2: MOSWOC REFM model

